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The effectiveness of the 'environment & health' course in increasing students' awareness & knowledge on environmental health issues

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Abstract

The 'Environment and Health' course which was introduced as part of the general education curriculum at Universiti Kebangsaan Malaysia in year 2000, is multidisciplinary in nature. The course aims at developing students' understanding towards the interactions between man and environment; and how this relationship affects their health and well being. The purpose of this paper is to assess the effectiveness of this course in raising the students' levels of awareness and knowledge on environmental health issues. The findings from a pre-test and post-test assessment indicate that the level of awareness and knowledge have increased, especially with regard to familiar issues.

Keywords: Awareness; environmental health; higher education; knowledge; teaching and learning

1. Introduction

The Centre for General Studies (CGS), Universiti Kebangsaan Malaysia (UKM) introduced the 'Environment and Health' course as part of the general education curriculum for undergraduate students (Rozita, Mashitoh and Latifah, 2011). It was introduced in year 2000, as one of the environmental-based courses, under the 'breadth of knowledge' (U3) component that aims at providing students with a wide area of knowledge to enrich and complement their respective areas of specialisation. This is consistent with the goals adopted by CGS at UKM, which is 'to equip students with appropriate knowledge in preparation to live in a modern society' (Pusat Pengajian Umum, 2009/2010). This complementary relationship between general studies and specialised knowledge was emphasised by Syed Hussien Al-Atas (1998) in his paper entitled 'Philosophical Foundation of the General Education', which addresses the question of the kinds of knowledge that is required for the survival of a modern society in Malaysia. CGS, in response to this question, believes that environmental knowledge is very critical and

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therefore, introduced courses with environmental theme to UKM students. The ultimate goal of these courses is to promote environmental literacy among the students, so they will become environmentally literate persons who demonstrate the appropriate attitude and behaviour (Moseley, 2000). CGS, in our capacity as a 'service centre' for the university, has the opportunity to reach out for students from all faculties and thus, providing us with the possibility to impart appropriate knowledge and skills to these students.

However, since the introduction of the 'Environment and Health' course, there were no studies undertaken to assess the effectiveness of the course. We are yet to know whether the knowledge has been effectively transferred to the students and whether or not, has increased the levels of their environmental literacy and awareness. This study therefore is undertaken to assess the effectiveness of knowledge transfer in 'Environment and Health' course to the students, by observing their level of awareness in environment and health matters. Thus, this paper discusses the effectiveness of environment and health course in terms of the level of base-line awareness and knowledge of the students before they went through this course and the level of awareness and knowledge obtained by the students after they have completed the course. This study has provided many insights to future improved the curricular of environment and health course.

2. Literature review

The World Health Organization (WHO) defines environmental health as "those aspects of the human health, including quality of life, that are determined by physical, biological, social and psycho-social factors in the environment" (Landon, 2006:5). Landon (2006:6) further explains that "the WHO definition of environmental health highlights the connection between the state of the environment and the health experiences of individuals and communities" and "the relationship between human activities and the environment has the potential to either impair or improve health". Landon suggests that one of the ways that can help in mitigating the adverse effects from human and environment relationship is through education. This echoes Roth's (1992) assertion that calls for the promotion of environmental literacy as the primary goal for environmental education. He proposed the incorporation of environmental literacy into general education curriculum.

Roth further explains that environmental literacy involves a continuum of competencies that develop over time. This continuum ranges from zero competency to very high competency, which, Roth classifies as 'nominal', 'functional' and finally 'operational' environmental literacy. In other words, environmental literacy develops from awareness to knowledge and finally, action. Roth argues that the task of nurturing and developing environmental literacy should be fostered at all levels in the education system, from school through the higher learning institutions. This is the case because environmental literacy is crucial in ascertaining the survival of our modern society.

According to Brown et al., (2005), radical changes in the biosphere and human interaction with the environment are increasingly impacting on the health of populations across the world. WHO reported that from the 14 regions worldwide study, it was evident that environmental risk factors play a role in more than 80% of the diseases occurrences. JunFeng et al., (2010) emphasise that environmental risk factors, especially air and water pollution, are major sources of morbidity and mortality in China. According to JunFeng et al., (2010), China's population is subject to both traditional and modern environmental risk factors. Traditional risks include poor sanitation and indoor air pollution resulted from coal, wood, and crop residue combustion; while modern risks are associated with industrialisation and urbanisation such as outdoor air pollution and industrial waste. These risks are heightened due to the existing risk factors, such as climate change and trans-boundary transportation of air pollutants. Ling & Ting (2010) also found that intensive development activities with high density of commercial, population, traffic volume and lesser green area can increase air pollution level and air related disease significantly.

3. Methodology

Qualitative and quantitative approaches have been adopted in this study in compliance with action research procedures which involve levels of diagnostic, reflection, interventions and re-evaluation. However, this paper only reports the result of diagnosis and their reflections because the intervention and its evaluation are yet to be introduced and administered. The research sample consisted of the whole population (N=220) of UKM students who registered and attended ZZZT2323 course during the first semester in the 2009-2010 academic session. The levels of environmental and health knowledge and awareness were tested two times ('pre-test', i.e. before the start of proper

lectures and classroom activities and 'post-test', i.e. at the end of the semester). Survey instrument was developed by researchers based on previous research instrument by Wojtowicz (1995) with the additional of new items on issues related to environment and health that have not been studied by previous researchers, but are relevant to the current Malaysian environmental and health scenario. Cronbach's coefficient was used to calculate the reliability of the scales. The instrument has good reliability with the Cronbach's Alpha values for the awareness scale 0.934 and the knowledge scale 0.667.

4. Results and discussion

4.1 Profile of respondents

A total number of 220 students, from two sets of class, answered the survey questions. For set 1, the total number of students was 107. Except for nine second year students and one fourth year student, the rest of the class consisted of second year undergraduates. For the second set, there were 113 students. The majority of the class was made up of third year students (n=92). One student was from year one, while the remaining 21 were second year students. A brief profile of the respondents who took part in this study is represented in Table 1 below:

Table 1. Number of respondents' according to faculty

Faculty	Set 1	Set 2	Total
Faculty of Science & Technology	56	67	123
Faculty of Social Sciences & Humanities	12	9	21
Faculty of Economy	27	34	61
Faculty of Education	3	3	6
Faculty of Islamic Studies	9	0	9
Total	107	113	N = 220

4.2 Awareness

According to pre-test survey at diagnostic level, the mean score for most of the items (item 1 to item 16 and item 18, Table 2) that measure students' awareness towards issues related to environment and health are at moderate level (mean score 3-5). However, the mean scores are higher for items that are related to water and air issues (mean scores above 5) (item 17, 19, 20, Table 2).

Table 2. Level of students' awareness on environment and health issues

Item	Mean score ± standard deviation	
	Pre-test	Post-test
1. The overall concept of health.	4.47 ±0.97	4.98±0.84
2. Causes of food contamination.	4.90 ±0.88	5.08±0.91
3. Preventive measures of food pollution.	4.85±0.92	5.06±0.94

4.	Effects of food additives on human health.	4.77±1.01	5.01±0.97
5.	Role of vectors in disease transmission.	4.45±1.05	4.81±1.02
6.	How to control vector/organisms/agents of disease.	4.18±1.10	4.74±0.98
7.	Types of dangerous radiation to human health.	4.26±1.23	4.65±1.01
8.	Effects of radiation on human health.	4.36±1.25	4.79±0.99
9.	Preventive measures of radiation.	4.03±1.23	4.60±1.03
10.	Effects of occupational environment on health.	4.69±1.00	5.06±0.96
11.	Types of hazardous waste.	4.15±1.05	4.37±0.99
12.	Effects of hazardous waste on human health.	4.23±1.05	4.61±1.02
13.	Effects of pesticides on human health.	4.43±1.01	4.85±0.95
14.	Effects of solid waste on human health.	4.12±1.08	4.61±1.03
15.	Proper solid waste management.	3.92±1.09	4.58±1.05
16.	Effects of noise on human hearing.	4.78±1.05	5.16±0.98
17.	Causes of water pollution in Malaysia.	5.21±0.91	5.30±0.97
18.	Quality of safe drinking water.	4.57±1.18	4.96±1.02
19.	Major causes of air pollution.	5.19±1.05	5.32±0.97
20.	Effects of air pollution on human health.	5.23±1.09	5.38±0.97

Interestingly, a specific trend has arisen from the mean scores. The students showed higher level of awareness on issues that are considered 'familiar' in their everyday life such as water (item 17) and air (item 19 and 20) pollution, followed by nutrition issues (item 2 to 4) and vectors-related issues (item 5) in comparison to the less familiar issues like radiation (item 7 to 9) and hazardous waste (item 11 and 12). The lower mean scores are also evident on items related to the management and mitigation of environmental problems which have adverse effects on health and the environment (item 9 and item 15). The higher mean scores of items related to water and air issues are supported by the findings of MacGregor and Kang (2007: 4) who found that during the interview, students easily identified "the effect of air quality", "water contaminants", or "water problem" with environmental health compared to other environmental health issues.

The lower level of awareness on less familiar issues could be grounded from the students' narrow self-interest which mould their concern only towards issues that arrive on their doorstep (Fazio, 1986), and/or the limitation of knowledge of those issues (Ostman & Parker, 1987). However, MacGregor and Kang (2007:1) argue that the standard set to assess students' achievement in science subjects has limited students' awareness:

> …standards for assessing science achievement tend to focus largely on the acquisition of knowledge and "facts" about science. Less attention has been paid to the development of curricula that both meets the need to increase students' awareness and understanding of science principles and at the same time improves their ability to employ scientific knowledge as part of the process

by which science is used to make decisions, both in their personal life as well as in society in general.

Hence, the curricular of environmental health is in need of a review to include the aspects of developing students' awareness of environmental health issues, and in order to achieve that, interdisciplinary approach in teaching and learning of this course should be adopted, i.e., principles and process skills from other disciplines, such as language, arts and social studies should be incorporated into the teaching and learning of environmental health (MacGregor and Kang, 2007).

In the post-test survey, the mean scores for every items have increased particularly for item 1 (the overall concept of health), 6 (vector control), 10 (effects of occupational environment on health) and 15 (waste management). The increase in the mean scores reflects the effectiveness of ZZZT2323 lectures and classroom activities in enhancing students' awareness of environmental health. This finding supported the finding by MacGregor and Kang (2007: 4) who found that students have developed "greater awareness of the importance of personal, risk-reducing behaviours with regard to environmental hazards" after they went through a course on environmental science. The authors also found that students' perceptions have increased on environmental health and safety risks. Hence, the findings by MacGregor and Kang confirmed the quantitative data of the current study that demonstrated students' increased awareness toward environmental health issues.

4.3 Knowledge

The pre-test survey in the diagnostic level indicated less satisfactorily levels of students' knowledge in environmental and health issues. Only 40% of the items are correctly answered by more than 50% of the students (item 1-4, 10-16, 20, Table 2) while 60% of items are correctly answered by less than 50% of students (item 5-9, 17-19, Table 2). The post-test survey however indicated an increase in the level of students' knowledge of environmental and health issues. More than 50% of the students gave correct answers to 60% of the items (item 5-11, 13-14, and 17-19). This shows that students became more knowledgeable on certain topics after attending lectures. However, the level of knowledge for some students are still low particularly in the topics related to nutrition (item 1 to item 4), genetically effective radioactive (item 12), air pollution index (item 15), precautions against toxic chemical compounds (item 16) and anthrax disease (item 20), even though after attending lectures. The underlying reason for the consistently lower level of knowledge on certain topics is possibly due to low engagement to those particular topics which could reduce the students' interest to learn the topics (Ballantyne & Packer, 1996). For example, the issues in item 12, 16 and 20 are not common issues which affected our daily life and therefore, it is likely for the students to ignore or disown such issues. As for the issues highlighted in items 1-4 and 15, even though these are common issues, the students might perceive that they are less empower to resolve these issues and left those for the scientist or experts to study.

Table 3. Level of students' knowledge of environmental and health issues

	Item	Percentage (%)			
		Right		Wrong	
		Pre-test	Post-test	Pre-test	Post- test
1.	*Lactobacillus acidophilus* is a food contaminant bacterium that can cause diarrhoea.	16.6	25.8	83.4	74.2
2.	*Rhodomine* B colouring additive is safe to be added in food.	9.8	33.0	90.2	67.0
3.	Additives in food is often labelled with initial letter B followed by number.	14.1	31.0	85.9	69.0

4.	Cooked food that stored at room temperature is safe to consume within 4 hours.	33.0	45.8	67.0	54.2
5.	Pesticides application is an environmental friendly approach in vector controls.	68.8	81.9	31.2	18.1
6.	*Aedes* mosquitoes like to breed in dirty water.	59.9	54.8	40.1	45.2
7.	High dose of natural radiation is not harmful to humans.	79.8	86.4	20.2	13.6
8.	Explosion test of nuclear bomb in remote areas do not contaminate the environment.	90.5	89.2	9.5	10.8
9.	Genetic effects due to radioactive waste exposure can be passed to the children.	85.0	84.7	15.0	15.3
10.	Alpha radiation produced by radioactive materials can be blocked by using a piece of paper.	36.8	54.8	63.2	45.2
11.	'Sick building' syndrome is often experienced by workers in closed air-conditioned offices.	44.3	76.8	55.7	23.2
12.	The dose of genetically effective radiation is double in effect.	6.8	14.2	93.2	85.8
13.	Continuous exposure to carbon monoxide gas would gradually reduce memory.	38.0	58.3	62.0	41.7
14.	*Lead* poisoning can result from paint chips.	48.4	62.7	51.6	37.3
15.	Public is advised to minimize outdoor activity when air pollution index value stood at 200.	28.5	23.3	71.5	76.7
16.	Employees affected by the toxic chemical compound (liquid form) should wear face mask.	35.4	40.7	64.6	59.3
17.	Piped water is safe to drink directly.	93.3	92.7	6.7	7.3
18.	Pesticide is not harmful to humans.	95.3	94.3	4.7	5.7
19.	Individual who frequently go to disco will develop hearing problem.	85.0	90.4	15.0	9.6
20.	Anthrax is incurable because the bacteria involved is resistant to high temperatures.	3.6	6.9	96.4	93.1

The findings of our current study support the finding by Hungerford and Volk (1990). According to Hungerford and Volk (1990), the sense of ownership and empowerment is critical in enhancing student interest to environmental-related knowledge. The sense of ownership inclined the students to take on responsibilities toward related issues while the sense of empowerment secure the belief that they can make changes and help resolve important issues. To acquire both, Hungerford and Volk (1990) suggest the educators to increase in-depth understanding of the ecological concept, to promote environmental sensitivity and to provide adequate skills of issue

analysis and investigations. In accord to Hungerford and Volk theory, Pooley and O'Connor (2000) also recognise the influence of beliefs and emotions in environmental knowledge acquirement. Their findings show that beliefs and emotions are important bases of attitudes towards environmental issues. They therefore suggest environmental educators to target these affective components along with cognitive component (knowledge) to increase students association with environmental issues.

To address lower level of knowledge on certain topics in environment and heal course, Weinger (1999) suggests participatory education (i.e., interactive; based on real-life experiences; incorporates dialogue between and among teachers and students; critically analyses the organisational and systemic causes of problems) as an approach to learning to increase students' knowledge on environmental health. Educators should create an environment where students are motivated to learn more out of curiosity or imminent need by engaging in controversial topics, or topics that have no clear-cut answers (Edelson, 2001). Furthermore, since certain environmental health topics can be downright depressing, educators should strive for a balance in which students do not feel overwhelmed by a preponderance of "bad news" (Schweizer & Kelly, 2005). Weinger (1999) also suggests audiovisual aids, such as blackboard, flipchart, overhead transparencies, slides, videotapes and films to effectively communicating new knowledge and increasing student interest and understanding.

Meanwhile, Jin and Bierma (2011: 84) suggests guided-inquiry learning, i.e., a process by which students "discover" basic concepts through active investigation for students to master facts and terms and concepts as the authors found that students appeared to perform slightly better on exam and quiz questions when the guided inquiry modules were applied, and although the difference is not statistically significant, students are able to comprehend these concepts more quickly and more thoroughly than when using traditional teaching methods. Silbart (2006), on the other hand, suggests problem-based learning exercises, i.e., premised on the self-directed acquisition of knowledge in a setting that requires the learner to restructure information in a realistic context, to be incorporated into an environmental health curriculum.

5. Conclusion

In conclusion, we found that there is an increase in the levels of awareness and knowledge in environmental and health matters after the respondents attended lectures on the subject (post-test diagnosis). We observed that the pre-test diagnosis indicated low level of environmental and health knowledge; while the levels of awareness were found to be high in familiar issues and moderate in less familiar issues. The post-test diagnosis was found to demonstrate significant increase in the level of awareness as well as the level of knowledge in most of the topics asked in the survey. The increase in the level of knowledge probably is pre-conditioned by the relatively high level of awareness prior to lectures which incurred the students' self-motivation to learn more of the course. These findings have partially revealed the effectiveness of this course in increasing students' levels of knowledge and awareness towards environmental and health matters. Further studies will be conducted to evaluate the comprehensiveness and the competitiveness of the course contents to determine the areas that need to be improved and improvised to increase the overall effectiveness of the course. Students' and experts' opinion regarding the course content will be gathered from time to time in effort to develop a coherent body of knowledge on environment and health that are relevant to the contemporary interest. In addition, future research should be conducted in the areas of teaching and learning methods used in environmental and health courses and their effects on the awareness and knowledge of students on environmental and health issues.

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